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ABSTRACT

"Postdictions" of college grade point averages (GPAs) from high school GPAs and/or American College Testing Program (ACT) composite scores were compared by gender and race for 1,121 freshmen and sophomore students at a West Virginia College. The sample included 945 white and 176 black students, and 553 males and 568 females. Significant differences in postdictions were found for race and gender with substantially greater frequencies of over/under postdictions when the ACT composite score was the only predictor variable. Significant differences between validity coefficients of two linear regression models were found. One model used combined ACT composite scores and high school GPA to predict college GPA, while the other made a direct prediction of college GPA from ACT composite scores. Results of the former model indicated that high school GPA contributed significantly to prediction efficiency. No significant gender or race differences were found between regression coefficients or intercepts in either predictive model. There were significant gender and race differences between high school GPAs, college GPAs, and ACT composite scores in all state universities and colleges. College GPAs were under-postdicted for female white students and over-postdicted for male students. Significant gender and race postdiction differences were found in different predictor models and from different sample pools. A 19-item list of references and 6 data tables are included. (TJH)

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Postdictions of College GPAs from ACT Composite Scores and High School GPAs: Comparisons by Race and Gender

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Running Head: POSTDICTIONS OF COLLEGE GPA's

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Abstract

Postdictions of College GPAs (CGPA) from High School GPAs (HSGPA) and/or ACT Composite Scores (ACTComp) were compared by gender and by race for freshmen and sophomore students at a West Virginia College. Significant differences in postdictions were found for race and gender with substantially greater frequencies of over/under postdictions when the ACTComp score was the only predictor variable. Significant differences between Model A and Model B validity coefficients ($\underline{R}_s^2$) were found with HSGPA substantially contributing to the prediction efficiency of Model A. No significant gender or race differences was found between regression coefficients or intercepts in either predictive model. There were significant gender and race differences between HSGPAs, CollGPAs and ACTComp scores in all state universities and colleges. CGPAs were under postdicted for female white students and over postdicted for male students. Significant gender and race postdiction differences were found in different predictor models and from different sample pools.

Postdictions of College GPAs from ACT Composite Scores and High School GPAs: Comparisons by Race and Gender

The prediction of college grade point average (CGPA) has been a research topic of interest for several years, especially as it applies to possible race and gender bias (Aleamoni & Oboler, 1978; Cole, 1973; Cordes, 1976; Gamache & Novick, 1983; Hunter & Schmidt, 1978). Various aptitude tests have been incorporated into selection procedures ranging from military and industrial applications to college admission programs and the predictive efficacy of these tests has been evaluated in many settings (Hunter, Hunter, & Schmidt, 1979). Linear equations based on the majority group and on combined groups often are used to ascertain systematic errors in prediction (Boehm, 1977; Calkins & Whitworth, 1974; Hunter, Schmidt, & Rauschenberger, 1977; Humphreys, 1973; Temp, 1971) and some research has found gender and race differences between regression slopes, intercepts and validity coefficients. Linn (1973, 1978), however, believes that the essential issue relating to test bias is whether regression equations over- or under-predict a specific group.

Many studies of academic prediction have utilized American College Test (ACT) scores or Scholastic Aptitude Test (SAT) scores,

combined with high school grade point averages (HSGPAs) as predictor variables, and have compared resulting parameter estimates by race and by gender (Clark & Grandy, 1984; Thomas, 1975).

The purpose of this study is to compare each student's actual grade point average with his/her postdicted CGPA from two predictive models based on different subsamples at a four-year state college. Comparisons of postdicted CGPAs from ACT composite scores (ACTComp) combined with HSGPA or ACTComp alone as predictor variables and derived from same gender, same race and total samples. Also, over-under-postdictions, regression coefficients, intercepts, and validity coefficients will be compared by race and by gender.

Method

Subjects

ACTComp scores, HSGPAs and CGPAs were available for freshman and sophomore students (N = 17,620) enrolled in 13 institutions of higher learning in West Virginia in 1985 (see Table 1).

Insert Table 1 about here

The problem of this investigation concerns race and gender

differences in over-under-postdictions; consequently, indepth analyses were performed on data from only college G (Table 1), which has the largest proportion of enrolled black students (n=176) of any college in the state.

Procedures

Two linear regression models, derived from same gender and same race sub-samples, as well as, total college G sample were used to postdict student CGPAs. The ACTComp score and HSGPA were independent variables in Model A, and the ACTComp score was the independent variable in Model B. Regression equations, validity coefficients, and intercepts were derived from both predictive models based on the following samples: (a) total sample (N = 1121), (b) white students (n = 945), (c) black students (n = 176), (d) male students (n = 553, and (e) female students (n = 568) (see Table 2).

Insert Table 2 about here

The CGPA for each student was individually postdicted by each regression model, within each sample, and compared with his/her actual CGPA. CGPAs falling one standard error of estimate ($-1SE_{est}$) below the regression line are defined as overpostdicted; CGPAs

above +1SE_{est} are defined as underpostdicted.

Frequencies of over-under-postdictions of CGPAs based on both models derived from the total sample were compared by gender and by race (see Table 3).

Insert Table 3 about here

Postdictions by race using both models and derived from same-gender subgroup sampls were compared. Postdictions by gender using both models and derived from same-race subgroup samples were compared (see Tables 4 & 5).

Insert Tables 4 & 5 about here

Mean differences of ACTComp, HSGPAs, and CGPAs were analyzed by independent *t* tests as follows: male vs. female, black male vs. white male, black male vs. black female, black female vs. white female and white male vs. white female (see Table 6).

Insert Table 6 about here

Results

Postdictions of CGPAs based on the total college G sample (N = 1121) revealed a significantly greater frequency of over-postdicted male CGPAs and under-postdicted female CGPAs with both predictive models (See Table 3). When comparing postdictives by race (N = 1121), there was a greater frequency of over-postdicted black student CGPAs from both models. All-χ^2 results of frequencies of postdictions by race and gender were significant when based on total sample in Models A and B, with greater frequencies of postdictions when using only the ACTComp as a predictor variable.

When postdictions of CGPAs were based on the all-male sample, (Table 4) black males were significantly overpostdicted in Model A but not in Model B. When the all-female sample was used, no race difference in postdiction was found in either model.

Postdictions by gender were analyzed (see Table 5) using both regression models and based on same-race samples. There were significantly over-postdicted CGPAs for male students and under-postdicted CGPAs for female students in Model B in the all white sample.

Analyses of differences between regression coefficients and intercepts (Table 2) by race and by gender revealed no significant

difference in either model. The intercept differences between white and black student postdictions, Model B, approaches significance (t = 1.65, p .05). Validity coefficients (R^2) were significantly different between Model A and MOdel B, with HSGPA substantially contributing to the prediction efficiency of Model A. Validity coefficients in both models were consistently higher for female than for male student samples.

Discussion

Most high school students are required to take the SAT or ACT as part of the college admission procedures. The ACT is the predominant college admission tests used in West Virginia; however, some students are admitted to colleges based on other criteria. In this study only students for whom ACT scores were available were included in the analyses. Further, no effort was made to control for possible confounding effects of different curricula chosen by students which may contribute to some gender and/or racial differences in CGPAs (Gamache & Novick, 1983).

Most studies have shown that predictions (median R = .58) of college freshman GPA are more accurate when HSGPA is combined with the ACTComp. Postdiction accuracy in this study was substantially increased by including HSGPA with the ACTComp in the predictor model. Usually, reported validity coefficients

have been somewhat higher for white students than for black students contrary to the results of this study (see Table 2) (Cleary & Grandy, 1984; Darlington, 1971).

Comparisons of CGPA and ACTComp (Table 1) revealed that the average CGPA of white students was higher than black students in all colleges in West Virginia except Community College B. Also, the ACTComp scores were significantly higher for white than black students at every college. Male students earned higher mean ACTComp scores than female students; however, their mean CGPAs were lower. Gender differences also have been found on the SAT scores for the past several years (Cordes, 1986).

Results of this study support the hypothesis that female academic performance tends to be under-postdicted while male academic performance tends to be over-postdicted; the frequencies of over-under-postdictions are decreased when HSGPA is included in the predictive model. When the total sample ($\underline{N}$ = 1121) was used in Model A, black student CGPAs were over-postdicted.

White students in this study earned higher ACTComp than black students; consequently, white students would be favored over black students in a college admission program when only an ACTComp cutting score is used. Frequently, minimum test scores are used in college admission procedures; as a result, black

students would more likely be rejected than white students when only test scores are used in making college admission decisions.

Gender and racial differences were found in ACTComp scores, CGPAs and in postdictions of CGPAs (Tables 2 and 6). Historically, such differences have been explained by genetic, social environmental, and demographic theories; others have argued that psychological tests are racially biased. Zajonc (1986) has posited the confluence model to explain racial differences in academic performances based on family expectations. Explanatory theories of gender and racial differences are elusive at best; no definitive theory has been developed. From a pragmatic view, however, results of this study suggest that college admission policies should take cognizance of documented gender and racial differences in test scores and academic grades, as well as predictive differences, in an effort to minimize unintentional gender and/or racial discrimination in their college admissions procedures.

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Table 1

College Grade Point Average (CGPA) and ACT Composite Score (ACTComp) for Freshman/Sophomore Students By Gender and Race

	MALE						FEMALE					
	WHITE			BLACK			WHITE			BLACK		
Institution	N	CGPA	ACT	N	CGPA	ACT.	N	CGPA	ACT	N	CGPA	ACT
Universities												
A	1308	2.15	18.24	53	1.86	13.89	1763	2.38	17.73	65	1.99	12.28
B	2072	2.27	20.27	88	1.90	14.93	1762	2.42	19.44	60	1.70	14.35
Colleges												
A	359	1.98	17.38	37	1.96	12.27	397	2.63	16.97	24	1.60	11.63
B	1028	2.11	16.19	39	1.89	12.21	1233	2.35	16.34	41	1.68	10.95
C	18	2.08	15.56	2	1.24	9.50	16	1.86	14.63	1	1.57	14.00
D	550	2.29	19.09	33	2.01	12.52	743	2.55	18.42	17	1.77	12.47
E	448	2.09	16.57	17	1.73	12.76	574	2.42	16.62	4	1.85	10.25
F	860	2.20	18.83	71	1.99	12.92	455	2.35	16.78	63	1.82	12.87
G	459	2.32	16.64	94	1.88	11.59	486	2.61	15.97	82	2.05	11.62
H	394	2.49	17.02	56	1.78	11.43	571	2.64	16.83	86	1.92	11.36
Community												
A	146	2.70	17.40	-	-	-	212	2.70	16.15	1	2.68	23.00
B	200	2.38	14.88	3	2.70	12.33	206	2.59	15.01	4	2.34	8.25
C	232	1.85	15.61	36	1.31	10.36	141	2.17	15.50	12	1.19	9.67
TOTALS: N=17,620	8075	2.21	18.19	526	1.86	12.66	8559	2.43	17.47	460	1.85	12.10

Table 2

Regression Analyses: Gender and Race Comparisons by Model

	n	R^2	F	$B_{ACTComp}$	$SE_{ACTComp}$	B_{HSGPA}	SE_{HSGPA}	Intercept	SE_I
Model A: CGPA = ACTComp + HSGPA									
Gender:									
Male	553	.2083	72.35	.04156	.0066	.42426	.0585	.5164	.1512
Female	568	.2757	107.51	.04777	.0077	.44061	.0598	.2352	.1625
t	-	-	-	(0.6039)	-	(1.5103)	-	(.12669)	-
Race:									
White	945	.2230	135.14	.03792	.0057	.52710	.0442	.4074	.1287
Black	176	.2515	29.07	.04874	.0120	.47317	.0991	.2653	.2382
t	-	-	-	(0.8147)	-	(0.4970)	-	(0.4242)	-
Total N	1121	.2539	190.25	.04223	.0050	.4278	.0404	.3154	.1098
Model B: COLLGPA = ACTComp									
Gender:									
Male	553	.1326	84.26	.05898	.0064	-	-	1.3218	.1072
Female	568	.1668	113.35	.07805	.0074	-	-	1.3219	.1197
t	-	-	-	(0.0098)	-	-	-	(0.0006)	-
Race:									
White	945	.1059	111.68	.06112	.0058	-	-	1.4797	.0986
Black	176	.1529	31.40	.06741	.0120	-	-	1.1828	.1493
t	-	-	-	(0.4720)	-	-	-	(1.6594)	-
Total N	1121	.1398	181.84	.0699	.0050	-	-	1.3531	.0815

Table 3

Comparisons of Frequencies of Over/Under-Postdictions of CGPAs by Gender and Race

Model A: CGPA = ACTComp + HSGPA; R^2 = .2529, N = 1121

	Over-Postdiction	Under-Postdiction
Gender		
Male (n = 553)	88	50
Female (n = 568)	65	84

chi x^2 (df = 1) = 4.4, p < .01

Race		
White (n = 945)	128	123
Black (n = 176)	25	10

chi x^2 (df = 1) = 4.4, p < .05

Model B: CGPA = ACTComp; r^2 = .1398, N = 1121

	Over-Postdiction	Under-Postdiction
Gender		
Male (n = 553)	92	39
Female (n = 568)	63	113

chi x^2 (df = 1) = 34.3, p < .01

Race		
White (n = 945)	130	144
Black (n = 176)	25	11

chi x^2 (df = 1) = 10.7, p < .01

Table 4

Comparison of Frequency of Over/Under-Postdictions by Race Based on Same Gender Sample

Model A: CGPA = ACTComp + HSGPA

	Over-Postdiction	Under-Postdiction
All Male Students (N = 553, R^2 = .2083)		
White (n = 459)	62	64
Black (n = 94)	15	4
chi X^2 (df = 1) = 4.7, $p < .05$		
All Female Students (N = 568, R^2 = .2757)		
White (n = 486)	59	58
Black (n = 82)	8	6
chi X^2 (df = 1) = .04, $p > .05$		

Model B: CGPA = ACTComp

	Over-Postdiction	Under-Postdiction
All Male Student (N = 553, r^2 = .1326)		
White (n = 459)	65	69
Black (n = 94)	14	6
chi X^2 (df = 1) = 2.4, $p > .05$		
All Female Students (N = 568, r^2 = .1668)		
White (n = 486)	65	66
Black (n = 82)	10	5
chi X^2 (df = 1) = 1.0, $p > .05$		

Table 5

Comparison of Over/Under-Postdiction by Gender Based on Same Race Sample

Model A: CollGPA = ACTComp + HSGPA

	Over-Postdiction	Under-Postdiction
All White Students (N=945); R^2 = .2230		
Males (n = 459)	78	55
Females (n = 486)	48	56
chi X^2 (df = 1) = 3.2, $p > .05$		
All Black Students (N=176); R^2 = .2516		
Males (n = 94)	17	7
Females (n = 82)	8	13
chi X^2 (df = 1) = 3.6, $p > .05$		

Model B: CollGPA = ACTComp

	Over-Postdiction	Under-Postdiction
All White Students (N=945); r^2 = .1059		
Males	73	30
Females	56	94
chi X^2 (df = 1) = 26.2, $p < .01$		
All Black Students (N=176); r^2 = .1529		
Males	16	8
Females	10	17
chi X^2 (df = 1) = 3.4, $p > .05$		

Table 6

Comparisons of Gender and Race Differences between Means of ACTComp, HSGPA and CGPA (Independent ts)

GROUPS	ACTComp	HSGPA	CGPA
Female vs Male	1.6	*8.01	*5.95
Black F vs Black M	0.06	*2.68	1.46
White F vs White M	2.08	*7.53	*4.78
Black vs White	*3.49	1.54	*9.01
Black F vs White F	*8.63	*5.71	*5.83
Black M vs White M	*9.38	0.24	*5.07

*Sig. p. < .01